solved in a mixture of ether and alcohol, is transformed into a crystalline fat, which softens at 69° and melts at 77°.

The behavior of olive oil is very peculiar. It combines with three times the quantity of hydrogen which was anticipated from its behavior with iodine. The product, which in general properties resembles that from castor oil, is still capable of combining with iodine. Unless, therefore, some flaw can be shown to exist in the experiments, it will be necessary to revise our ideas of the processes which take place during the ordinary testing of oils and fats with iodine (Hübl's method).

Train oil absorbed about 30 per cent. more hydrogen than was anticipated. The yield of solid fat was quantitative. Before reduction the train and olive oils were converted into emulsions with water and a little gum arabic.

These results promise to be of great importance to plant physiologists, because the reactions proceed under conditions comparable, in a number of respects, with those under which similar or identical products are formed in nature. To the industrial chemist the results may also prove to be of considerable value; a reasonably cheap method of transforming liquid oils into solid fats has been much sought after.

J. BISHOP TINGLE

McMASTER UNIVERSITY,
TORONTO, CANADA,
August, 1908

SOCIETIES AND ACADEMIES

JOINT MEETING OF GEOLOGISTS OF THE NORTHEASTERN UNITED STATES WITH THE SECTION OF GEOLOGY AND MINERALOGY OF THE NEW YORK ACADEMY OF SCIENCES

THE Section of Geology and Mineralogy of the New York Academy of Sciences in cooperation with the geologists of neighboring institutions held an all-day meeting on April 6. The general invitation sent out by the academy met with a generous response. Representatives attended from Massachusetts Institute of Technology, Amherst, Wesleyan, Universities of Vermont and Pennsylvania, Dartmouth, Lehigh, Rutgers, Harvard, Yale, New York University and Columbia in addition to the local membership. Two sessions were held, one in the rooms of the department of geology at Columbia University, the other in the academy quarters at the American Museum of Natural History. Fourteen papers were presented and eight others were read by title. Abstracts of some of these papers are given below:

The Cambrian Rocks of Vermont: G. H. PERKINS, State Geologist of Vermont.

So far as satisfactorily determined, the Cambrian of Vermont occupies a narrow strip from north to south through the state between the Green Mountains and Lake Champlain. In some places they reach the shore of that lake and form the boldest of the headlands.

Northward the Cambrian extends to the Gulf of St. Lawrence and south through New York to middle Alabama.

It is probable that there are derivatives from Cambrian strata in and east of the Green Mountains, but none have been certainly identified. So far as studied, all the beds belong to the Olenellus zone of Walcott, or Lower Cambrian. The very interesting and extensive fault and overthrust by which Cambrian strata were lifted and thrown over the Utica is noticed. In all there are not less than 10,000 feet of Cambrian beds in western Vermont. These beds consist of 1,000 feet of more or less silicious limestone, and the other rocks are shales, sandstones, quartzites, conglomerates, of very diverse color composition and texture. In a few places the red sandrock beds change to a thick-bedded brecciated calcareous rock which when worked is the Winooski or Champlain marble—a mottled red and white stone used in many large buildings in many parts of the country.

Few of the beds are fossiliferous, but some abound in trilobites, Olenellus, Ptychoparia, etc., and a few brachiopods, worm burrows, trilobite and other tracks, etc., are also found. In all the number of species is not large, probably not more than fifty have been found. Of these, trilobites form the larger number, brachiopods coming next. A large portion of the species were described from the Vermont beds and many have not been found elsewhere.

Most of the beds are thin, but there are some several feet thick.

The great beds of roofing slate which are extensively worked in southwestern Vermont are included in the Cambrian.

Newark Copper Deposits of Pennsylvania: EDGAR T. WHERRY, University of Pennsylvania.

The Newark series in eastern Pennsylvania is divisible into five formations, and attains a total

thickness of over 20,000 feet. In the upper part there is a large trap sheet, about 1,500 feet thick, which shows the character of an intrusive sill.

Copper was first mined in this region at Bowman Hill, on the Delaware, by the Dutch, from New Amsterdam, about 1650. But the most important early operation was the Old Perkiomen Mine, at Schwenksville, opened about 1700.

Three types of deposit are known: those connected with trap sills, those in fissure veins and those in unaltered shales. Deposits of the first type show grains and streaks of bornite and chalcopyrite scattered through the metamorphosed shales. In the second brecciated fissures are filled with these ores and various accessory minerals. The magmatic origin of the metals in these cases is clear enough, but the source of the films of malachite and chrysocalla occasionally found in the undisturbed and unaltered sedimentary rocks is obscure. Though perhaps none of these deposits is sufficiently rich to repay working, they are not without their interesting features.

Petrography of the Newark Intrusive Diabase of New Jersey: J. Volney Lewis, Rutgers College.

The intrusive trap that forms the Palisades of the Hudson extends in outcrops several hundred feet thick from west of Haverstraw, N. Y., southward to Staten Island and, somewhat intermittently, westward across New Jersey to the Delaware River, having an aggregate length of outcrop of about 100 miles.[1] It is everywhere a medium to fine-grained dark gray heavy rock, with dense aphanitic facies.

The typical coarser rock contains in the order of abundance, augite, plagioclase feldspars, quartz, orthoclase, magnetite and apatite. The first two occur in ophitic to equant granular textures and the next two in graphic intergrowths which sometimes constitute as much as one third of the rock. In the contact facies micropegmatite disappears and scattering crystals of olivine occur.

A highly olivinic ledge 10 to 20 feet thick and about 50 feet from the base of the sill is exposed in the outcrops northward from Jersey City for about 20 miles. The olivine crystals, which constitute 15 to 20 per cent. of the rock, occur as poikilitic inclusions in the augite and feldspar.

Chemically the trap ranges from less than 50 per cent. to more than 60 per cent. of silica, with a corresponding variation in alumina, ferric oxide and the alkalis, while ferrous iron, lime and magnesia vary inversely. The augite is rich in these latter constituents and poor in alumina, giving a great preponderance of the hypersthene and diopside molecules. The feldspars range from orthoclase and albite to basic labradorite. Doubtless there is always more or less anorthoclase also, since all feldspar analyses show potash.

While there is considerable range in the proportions of the minerals, augite usually comprises about 50 per cent. of the rock, the feldspars about 40 per cent., quartz 5 per cent. and the ores 5 per cent., constituting a quartz-diabase, with normal diabase and olivine-diabase facies. In the quantitative system it is chiefly a camptonose (III., 5, 3, 4), with the acidic *dacose* (II., 4, 2, 4) and *tonalose* (II., 4, 3, 4) and the more basic *auvergnose* (III., 5, 4, 4, 5) facies. The olivinic ledge is *Palisadose* (IV., 1^2, 1^2, 2), the name here suggested for this hitherto unnamed subrang.

Slight basic concentration at the contacts, possibly according to Soret's principle, followed by differentiation by gravity during crystallization of the main mass, especially by the settling of olivine and the ores and the rising of the lighter feldspars in the earlier and more liquid stages of the magma, accounts for the facies observed and their present relations.

The Origin of Beach Cusps: D. W. Johnson, Harvard University.

Two theories have been advanced to account for the origin of beach cusps. According to one theory the cusps result from the accumulation of seaweed along the shore and the breaking of water through the seaweed barrier, removing sand and gravel where the break occurs and molding the remaining deposits into cuspate forms. According to the second theory the cusps are formed where intersecting waves reach the shore. There are serious theoretical objections to both these theories and still more serious practical objections. Experiments show that the cusps can be formed in the laboratory by parallel waves which are in turn parallel to the beach; and numerous observations seem to show that they are generally so formed in nature. The cause of cusp formation is to be found in the physical properties of fluids descending an inclined plane, as will be shown more fully in a forthcoming paper.

The Form of Nantasket Beach: Wm. G. Reed, Jr., Harvard University.

Nantasket Beach consists of several drumlins

[1] J. Volney Lewis, "Structure and Correlation of the Newark Trap Rocks of New Jersey," *Bull. Geol. Soc. of America*, Vol. 18, 66, 195–210; also "Origin and Relations of the Newark Rocks," Ann. Rept. State Geologist of New Jersey, for 1906, pp. 97–129.

tied together and to the mainland by a complex system of tombolos. Some of the drumlins show sea cliffs now abandoned by the waves. From the relations of these cliffs and the more ancient of the beaches, the initial drumlins have been reconstructed. The effect of marine action in cliffing the drumlins and stringing out the eroded material in successive tombolos has been followed through step by step, until the conditions of to-day were reached.

The study shows that Nantasket Beach is not the result of the accidental tying together of a few islands without system, but that it represents one stage in a long series of evolutionary changes, which have occurred in orderly sequence and in accordance with definite physiographic laws.

The Acid Extreme of the Cortlandt Series near Peekskill, N. Y.: CHARLES P. BERKEY, Columbia University.

The rocks of the Cortlandt series are known, through the work of the late Professors J. D. Dana and H. S. Williams. They occupy an area on the Hudson River just south of Peekskill, N. Y., and include a very wide range of granitoid medium to basic types of igneous rocks.

It seems certain that they represent a case of magmatic differentiation that includes not only the Cortlandt series, as outlined by Dana and Williams, but also two or three occurrences of typical granite. The granite area borders basic varieties on the northeast side. Actual contacts of the larger masses are not to be seen, but an occasional dike of granite cuts the adjacent diorite and gabbros, indicating a relationship as one of the latest developments. Furthermore, the granite shows consanguinity by its heavy soda content, soda-lime, feldspar predominating. It is, however, a very acid granite and introduces a considerably greater range of rock variety than formerly credited to the Cortlandt series, becoming its acid extreme.

The Evolution of Bogoslof Volcano in Bering Sea: T. A. JAGGAR, JR., Massachusetts Institute of Technology.

The island consists of four prominent peaks, old Bogoslof at the south, McCulloch Peak steaming actively in the middle, Metcalf Cone (sometimes called Perry Peak) adjacent to McCulloch in the north, and New Bogoslof or Fire Island ("Grewingk"), a flat table rock at the northwest end of the group. These are now all connected by continuous gravel and sand strips, where in one place there was a broad channel and seven fathoms of water a year ago.

McCulloch Peak and Metcalf Cone are both products of the slow pushing up from beneath the waves of a mass of refractory lava, semi-solid, crusting and breaking into blocks as it rises, with only the central portions retaining a semblance of fluidity.

A series of sketches were shown illustrating the remarkable differences in outline of this island at different intervals from 1826 to 1907.

In 1796 Old Bogoslof rose. In 1884 New Bogoslof, Fire Island, came into being and the waves joined the two with bars. In 1891 New Bogoslof was still steaming. In 1906 Metcalf Cone was reported midway between Old and New Bogoslof. In July, 1907, Metcalf Cone had broken in two, and the breaches between the islands were again connected with continuous land. On September 1, 1907, McCulloch Peak exploded and was wholly destroyed.

No such extraordinary story of growth and alteration of an island in the sea has ever been told before, and the changes of the later stages are unique in the annals of volcanology.

This paper is printed in full in the report of the expedition to Bogoslof.

Some Curves illustrating Coincident Volcanic, Seismic and Solar Phenomena: ELLSWORTH HUNTINGTON, Yale University.

In discussions of the possibility of some relationship between sunspots and earthquakes or volcanoes, attention has usually been concentrated upon sunspot maxima. Jenson, an Australian, however, has plotted the most important earthquakes and volcanic eruptions for the last century and more, and on comparing his data with the sunspot curve for the same period finds that there seems to be a grouping of the terrestrial phenomena at or near the time of sunspot minima. In order to test the validity of his conclusions another set of data as to earthquakes and volcanoes, prepared by Mr. R. W. Sayles for quite a different purpose, have been taken and similarly compared with the sunspot curve. In this case, as in the other, the grouping of terrestrial phenomena at times of sunspot minima is evident. In order to get rid of the personal equation, which enters so largely into such studies, and in order to get rid of temporary or local irregularities, all the data of both Sayles and Jensen have been averaged together. By repeated averaging of results as to the frequency and intensity of both earthquakes and volcanoes, the whole body of facts given by the two investigators, for a period of 117 years in one case, and 147 in the other, has

been combined into a single curve representing the progress of volcanic and seismic phenomena during the average sunspot cycle for the same period. On comparing this curve with the average sunspot curve, it appears that the minimum of the one coincides exactly with the maxima of the other and *vice versa*, and that times of increase in the one set of phenomena are times of decrease in the other. The coincidence can not possibly be accidental, for the repeated process of averaging would prevent the two curves from agreeing unless there were a genuine cause of agreement. The remarkable nature of the coincidence suggests that there is some common cause at work, producing a maximum occurrence of earthquakes and volcanoes upon the earth and a minimum occurrence of spots on the sun. The data used do not claim to be exhaustive, and the results are advanced as suggestive, rather than conclusive.

This paper appeared in full in the *Popular Science Monthly* for June.

The Volcanoes and Rocks of Pantelleria: HENRY S. WASHINGTON, New York.

Pantelleria is entirely volcanic. Its geologic structure has been variously interpreted, and the views of the writer differ in some important respects from those of other observers, notably Foerstner and Bergeat. There is supposed to have been formed first a large volcano, covering practically the whole area and submarine in its first stages. This was composed of rather siliceous soda-trachytes and later green pantellerites. The central and upper parts of this cone disappeared, probably by explosion, in analogy with the history of many other volcanoes, leaving a large central caldera, surrounded by an encircling somma with steep inner scarps and gentle outer slopes. Within the caldera arose the cone of the second period, now represented by Montagna Grande, the summit of which is the culminating point of the island, and Monte Gibele on the southeast. The lava of these is a very uniform soda-trachyte. The crater of Monte Gibele seems to have been the original eruptive center for the joint mass, but later the block of Montagna Grande was separated from the Gibele cone by a fault, with considerable tilting of the fault block. On the western and northern sides of this block there were formed several small parasitic cones, which gave vent to flows of black, glassy pantellerite. These and the trachytic flows of the Gibele volcano nearly filled the whole floor of the original caldera, the only portion left uncovered being a small corner at the north, where there is a small elliptical lake, which is thus regarded as a residual of the old caldera floor and not an eruptive center. The next phase of eruptive activity was confined to the northwestern part of the island, and the lavas are entirely feldspar-basalts, forming several small cinder cones, with flows of scoriaceous basalt. Eruptive activity on the island proper seems to have ceased, and is now evident only in some fumeroles and hot springs. The rocks show a wide range in chemical composition, but belong to but few distinct types. They are characterized by high soda, giving rise to the presence of abundant soda-microcline, ægirite and the triclinic cossyrite among the more salic types, and by the high amount of titanium among the basalts.

Other papers presented and those read by title are as follows:

Geology of Long Island: W. O. CROSBY, Massachusetts Institute of Technology.

Salt Formations of Louisiana: G. D. HARRIS, Cornell University.

Certain Silicified Tertiary Rocks of Arkansas: R. ELLSWORTH CALL, New York City.

Recent Advances in our Knowledge of the Magnetite Bodies at Mineville: JAMES F. KEMP, (By permission of the State Geologist of New York.)

Interpretation of the Mineral Constitution of Magnesian Minerals through their Analyses: ALEXIS A. JULIEN, Columbia University.

Silicified Woods of the Arkansas Tertiary: R. ELLSWORTH CALL, New York City.

Dwarf Faunas: HERVEY W. SHIMER, Massachusetts Institute of Technology.

Structure of the Brachial Support of Camarophorella, a Mississippian Meristelloid Brachiopod: J. E. HYDE, Columbia University.

A Revised Classification for the North American Lower Paleozoic: A. W. GRABAU, Columbia University.

Marginal Glacial Deposits: R. S. TARR, Cornell University.

An Erosion Problem in Arid Regions: RICHARD E. DODGE, Teachers College.

Notes on Recent Mineral Occurrences: GEORGE F. KUNZ, New York City.

The Gibeon Meteorite and other Recent Accessions at the American Museum: EDMUND OTIS HOVEY, American Museum of Natural History.

CHARLES P. BERKEY,
Secretary of Section